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EXAMINER	
BAND, MICHAEL A	
ART UNIT	**PAPER NUMBER**
1795	

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12/26/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/754,151	YAKSHIN ET AL.	
	Examiner	Art Unit	
	Michael Band	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 October 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 October 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. With regards to the objection to the drawing, the new figure 3 will replace the old figure 3. The objection is withdrawn.

2. Applicant's arguments, see, filed October 2, 2007, with respect to the rejection(s) of claim(s) 1-18 under 102 and 103 have been fully considered and are persuasive due to the argument that none of the references teach the mean free path being smaller than the distance between a target and a substrate. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Kobayashi et al (US Patent No. 6,077,403), Pinarbasi (US Patent No. 5,492,605), Telford et al (US Patent No. 5,643,633), Donohue et al (USPGPub 2003/0024808), and Gupta et al (Vacuum Technology & Coating).

3. Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-2, 6-7, 10-11, 14, 16, and 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Regarding claims 1-2, 6-7, 10-11, 14, 16, and 18, the phrase "especially" renders the claim(s) indefinite because the claim(s) include(s) elements not actually disclosed (those encompassed by "especially"), thereby rendering the scope of the claim(s) unascertainable. See MPEP § 2173.05(d).

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Kobayashi et al (US Patent No. 6,077,403).

With respect to claim 1, Kobayashi et al discloses a sputtering device allowing a film to be formed (abstract).Fig. 1 depicts a sputtering discharge gas [41], a valve [43], and a flux adjuster [44] to regulate the flow of the gas into a sputtering chamber [1]. Fig. 1 further depicts a distance between a target [2] and a substrate [50]. Kobayashi et al further discusses the distance between the target [2] and substrate [5] is about 120 mm, with the mean free path about 5mm or less (i.e. smaller) (col. 3, lines 55-60).

With respect to claim 10, Kobayashi et al further discloses a substrate-biasing high frequency power source [81] that applies a high frequency voltage to the substrate [50] (col. 4, lines 19-21). In addition, Kobayashi et al discusses the distance between the target [2] and substrate [50] being 120 mm (col. 3, lines 55-56).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 2 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al (US Patent No. 6,077,403) as applied to claim 1 above, and further in view of Pinarbasi (US Patent No. 5,492,605).

With respect to claim 2, the reference is cited as discussed for claim 1. However Kobayashi et al is limited in that the mean free path being larger than the distance between the target and substrate is not suggested.

Pinarbasi teaches "an ion beam sputter deposition system and method for the fabrication of multilayered thin film structures" (abstract), and that using a magnetron sputter-deposition device for fabrication of thin film devices is well known in the art (col. 1, lines 17-19). Pinarbasi further discloses that during operation, a "vacuum chamber is maintained at an internal operation pressure on the order of $1x10^{-4}$ Torr by a vacuum pump" (col. 5, lines 1-3). Pinarbasi depicts fig. 2 having a target [23] and substrate [31], with a distance between the target and the substrate. Pinarbasi states that "the mean free path for both sputtered target ions and the backscattered neutral atoms generally is greater than the distance between the target and the substrate" (col. 5, lines 56-58).

Pinarbasi cites the advantage of the greater mean free path as optimizing selected properties of each layer for single-layered or multilayered structures (abstract).

It would have been obvious to one of ordinary skill in the art to include a mean free path larger than the distance between substrate and target as taught in Pinarbasi for the device of Kobayashi et al to gain the advantage of optimized layers for single-layered and multilayered structures.

With respect to claim 11, modified Kobayashi et al further discloses a substrate-biasing high frequency power source [81] that applies a high frequency voltage to the substrate [50] (col. 4, lines 19-21). In addition, modified Kobayashi et al discusses the distance between the target [2] and substrate [50] being 120 mm (col. 3, lines 55-56).

11. Claims 3-4, 8-9, 12-13, 15, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Donohue et al (USPGPub 2003/0024808) in view of Pinarbasi (US Patent No. 5,492,605).

With respect to claim 3, Donohue et al'808 discloses a method of sputtering a layer from a target using Krypton as the sputtering gas at a pressure of less than 1 millitorr (abstract). Donohue et al'808 further discloses that the distance from the target to the wafer (i.e. substrate) is 430 mm (i.e. 43 cm) (p.1, para 14). Donohue et al'808 further states that the pressure is kept at 0.85 millitorr (i.e. approximately 0.1133 Pa) for the sputtering apparatus. Maintaining the pressure at 0.85 millitor and the distance from target to wafer at 430 mm would result in a pressure and distance product of approximately 4.87 cmPa, thus larger than 2.0 cmPa. However Donohue et al is limited

in that while at least one layer is deposited, it does not specify if two or more layers are deposited.

Pinarbasi teaches "an ion beam sputter deposition system and method for the fabrication of multilayered thin film structures" (abstract), and that using a magnetron sputter-deposition device for fabrication of thin film devices is well known in the art (col. 1, lines 17-19). Pinarbasi further teaches sputtering to provide single-layered or multilayered structures (abstract).

Since the prior art of Pinarbasi recognizes the equivalency of using sputtering to provide single- and multilayer structures, it would have been obvious to one of ordinary skill in the art to replace the single layer of Donohue et al with the multilayers of Pinarbasi as it is merely the selection of functionally equivalent sputtering techniques recognized in the art and one of ordinary skill would have a reasonable expectation of success in doing so.

With respect to claim 4, modified Donohue et al further discloses "switching to Krypton enables lower pressure operation ~0.15 millitor" (i.e. 0.02 Pa) (p.1, para 17) of the sputtering apparatus while still keeping the distance between target and wafer at 430 mm. The product of this pressure and said distance is approximately 0.86 cmPa, thus smaller than 2.0 cmPa.

With respect to claims 8 and 9, modified Donohue et al further depicts fig. 1 having a moving magnetron [1] and a magnet on either side of the magnetron (p. 1, para 13). As the magnet moves the magnetic field intensity is altered, thereby creating an unbalanced magnetron.

With respect to claims 12 and 13, modified Donohue et al further discloses that the substrate may be negatively biased for operation at low pressures (p. 1, para 6) using a power supply (p. 1, para 13). Donohue et al also states that the distance between the target to wafer (i.e. substrate) is 430 mm (i.e. 43 cm) (p. 1, para 14). Modified Donohue et al further states that using Krypton gas enables lower pressure operation of the apparatus (p 1, para 18).

With respect to claim 15, modified Donohue et al further discloses a plasma in proximity of the target (fig. 1, [2], [10]) confined by a magnetic field with a wafer (i.e. substrate) being biased by a power supply (p. 1, para 13). The voltage being applied to the target and plasma source is 135 volts (p. 1, para 14).

With respect to claim 17, modified Donohue et al further discloses the plasma source is a magnetron (p. 1, para 13; fig. 1, [1], [10]). The bias voltage being applied is 135 volts (p. 1, para 14).

12. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Donohue et al (USPGPub 2003/0024808) and Pinarbasi (US Patent No. 5,492,605) as applied to claim 3 above, and further in view of Telford (US Patent No. 5,643,633).

With respect to claim 5, the references are cited as discussed for claim 3. Modified Donohue et al further discloses that 0.85 millitorr pressure (p. 1, para 17) was attempted, giving a value greater than 2.0 cmPa. Subsequently switching to a pressure of ~0.15 millitorr gave a value smaller than 2.0 cmPa. However modified Donohue et al is limited in that while it does disclose two distinct products for working gas pressure

and distance between the target and substrate, it does not discuss separating the deposition process into two stages.

Telford et al teaches a technique for a film deposited by chemical vapor deposition (abstract) by a method such as sputtering (col. 1, lines 45-47). Telford et al further teaches using a two-stage process, the first stage comprising a high pressure first stage, followed by a low pressure second stage (col. 7, lines 55-60). Telford et al lists the advantage of this two-stage pressure differential as overcoming a tendency of contamination that would exist between the two stages (col. 7, lines 60-63).

It would have been obvious to one of ordinary skill in the art to separate the vacuum chamber into two deposition parts of distinct pressures taught in Telford et al in the sputtering apparatus of modified Donohue et al in order to gain the advantage of decreasing the contamination that exists between the two deposition stages.

13. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al (US Patent No. 6,077,403) as applied to claim 1 above, and further in view of Gupta et al (*Vacuum Technology & Coating*).

With respect to claim 6, the reference is cited as discussed for claim 1. However Kobayashi et al is limited in that while magnetron sputtering is disclosed and depicted, it is not specified whether the magnetron operates in an unbalanced mode.

Gupta teaches a method of sputtering a layer from a target utilizing sputtering gas (p. 4, para 2). Gupta further teaches using a moving magnetron (i.e. linear scanning) (p. 1, para 1). As the magnet moves the magnetic field intensity is altered, thereby creating an unbalanced magnetron. Gupta lists the advantages of using a

Linearly Moving Magnetron (LMM) as exceptionally high uniformities and repeatabilities (p. 1, para 2 and 4; p. 3, para 3; p. 4, para 5; p. 5, para 1).

It would have been obvious to one of ordinary skill in the art to use the moving magnetron taught in Gupta as the magnetron in Kobayashi et al in order to gain the advantages of exceptionally high uniformities and repeatabilities.

14. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al (US Patent No. 6,077,403) and Pinarbasi (US Patent No. 5,492,605) as applied to claim 2 above, and further in view of Gupta et al (*Vacuum Technology & Coating*).

With respect to claim 7, the references are cited as discussed for claim 2. However modified Kobayashi et al is limited in that while magnetron sputtering is disclosed and depicted, it is not specified whether the magnetron operates in an unbalanced mode.

Gupta teaches a method of sputtering a layer from a target utilizing sputtering gas (p. 4, para 2). Gupta further teaches using a moving magnetron (i.e. linear scanning) (p. 1, para 1). As the magnet moves the magnetic field intensity is altered, thereby creating an unbalanced magnetron. Gupta lists the advantages of using a Linearly Moving Magnetron (LMM) as exceptionally high uniformities and repeatabilities (p. 1, para 2 and 4; p. 3, para 3; p. 4, para 5; p. 5, para 1).

It would have been obvious to one of ordinary skill in the art to use the moving magnetron taught in Gupta as the magnetron in modified Kobayashi et al in order to gain the advantages of exceptionally high uniformities and repeatabilities.

15. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al (US Patent No. 6,077,403) as applied to claim 1 above, and further in view of Donohue et al (USPGPub 2003/0024808).

With respect to claim 14, the reference is cited as discussed for claim 1. Kobayashi et al further depicts in fig. 1 a plasma [P] in proximity of the target [2] with a magnetic field from magnets [71] in proximity of the target and plasma since it is expected that the magnetic field lines will extend uniformly to the target and substrate since electrode [6] is composed of the same material as the target [2] (col. 7, lines 1-7), thus allowing magnetic field through. However Kobayashi et al is limited in that while a power is attached to the target in fig. 1, a specific voltage is not suggested.

Donohue et al teaches a sputtering RF/DC magnetron (p. 1, para 14) with a plasma in proximity of the target (fig. 1, [2], [10]) confined by a magnetic field with a wafer (i.e. substrate) being biased by a power supply (p. 1, para 13). Donohue et al further teaches the plasma source is a magnetron (p. 1, para 13; fig. 1, [1], [10]). The voltage being applied to the target and plasma source (i.e. surface to be etched bias voltage) is 135 volts (p. 1, para 14).

It would have been obvious to one of ordinary skill in the art to use the voltage of Donohue et alas the voltage in the circuit for Kobayashi et al since Kobayashi et al fails to disclose a specific voltage and since Donohue et al teaches such voltages are functional in such devices, one would have a reasonable expectation of success in using the voltages of Donohue et al in Kobayashi et al.

16. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al (US Patent No. 6,077,403) and Donohue et al (USPGPub 2003/0024808) as applied to claim 14 above, and further in view of Pinarbasi (US Patent No. 5,492,605).

With respect to claim 16, the references are cited as discussed for claim 14. However modified Kobayashi et al is limited in that while the device is magnetron sputtering and bias the substrate at -100 V (col. 4, lines 32-35), it does not suggest etching.

Pinarbasi teaches "an ion beam sputter deposition system and method for the fabrication of multilayered thin film structures" (abstract), and that using a magnetron sputter-deposition device for fabrication of thin film devices is well known in the art (col. 1, lines 17-19). Pinarbasi further teaches that sputter deposition from a target or substrate ion-assisted etch or deposition during the operation of the apparatus (col. 13, lines 51-64). Pinarbasi cites the advantage of the apparatus capable of etching as optimizing selected properties of each layer for single-layered or multilayered structures (abstract).

It would have been obvious to one of ordinary skill in the art to include a mean free path larger than the distance between substrate and target as taught in Pinarbasi for the device of Kobayashi et al to gain the advantage of optimized layers for single-layered and multilayered structures.

17. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al (US Patent No. 6,077,403) in view of Holland (US Patent No. 4,311,725).

Kobayashi et al discloses a sputtering device allowing a film to be formed (abstract).Fig. 1 depicts a sputtering discharge gas [41], a valve [43], and a flux adjuster [44] to regulate the flow of the gas into a sputtering chamber [1]. Fig. 1 further depicts a distance between a target [2] and a substrate [50]. Kobayashi et al further discusses the distance between the target [2] and substrate [5] is about 120 mm, with the mean free path about 5mm or less (i.e. smaller) (col. 3, lines 55-60). However Kobayashi et al is limited in that while the layer is deposited by sputtering, it is not suggested to deposit the layer via electron beam evaporation.

Holland teaches control of deposition of thin films onto a substrate (abstract). Holland further teaches the films may be applied by any physical vapor deposition or chemical vapor deposition process, such as DC sputtering, RF sputtering, magnetron sputtering, electron beam evaporation, ion plating, and glow discharge (col. 1, lines 32-44).

Since the prior art of Holland recognizes the equivalency of electron beam evaporation and magnetron sputtering in the field of film deposition, it would have been obvious to one of ordinary skill in the art to replace magnetron sputtering of Kobayashi et al with electron beam evaporation of Holland as it is merely the selection of functionally equivalent film deposition techniques recognized in the art and one of ordinary skill would have a reasonable expectation of success in doing so.

Conclusion

18. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent No. 6,752,911.

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Band whose telephone number is (571) 272-9815. The examiner can normally be reached on Mon-Fri, 8am-4pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

20. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MAB

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